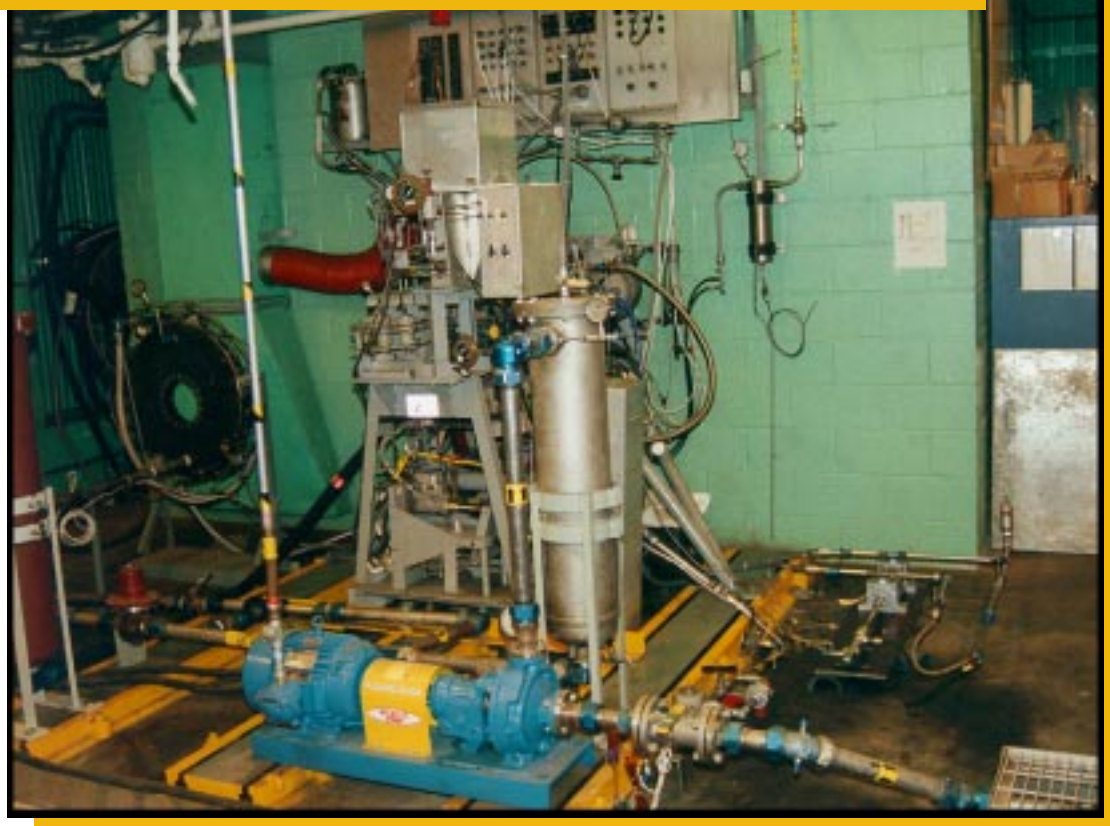
FUEL SYSTEMS, CONTROLS & DIAGNOSTIC TEST FACILITIES



The Naval Air Systems Team Fuel System, Controls and Diagnostic Test Facilities provide world class support to our Naval Integrated Program Teams, other Department of Defense services and industry in the areas of System Design, Development and Qualification, In-service support, Technology Development and Test and Evaluation. These facilities provide the capability for airframe and ground fuel component testing, propulsion fuel component testing and engine controls testing.

Provides world class support

DESCRIPTION

Fuel System Component Test Facility (FCT) was developed for the purpose of testing engine and airframe fuel system components. We operate and maintain a dedicated 'wet' bench test facility which provides the capability to test complete engine fuel control systems without running an actual engine. By utilizing a variety of electric drives, gearboxes, environmental conditioning of fuel and air, and specifically configured real-time control computers to simulate the engine commands necessary to operate the control system, we are capable of evaluating engine fuel systems and components as they operate under realistic conditions (i.e., "hardware-in-the-loop"). The FCT engine simulators can be configured to interface with any combination of hydromechanical and electronic propulsion control system components. The FCT is capable of testing engine control system software as well as hardware. The FCT's inventory of test equipment includes unique specialty equipment designed specifically for testing ground and aerial refueling components such as pressure refuel adapters, D-1 pressure refueling nozzles, MA-2 aerial refueling nozzles and MA-2/3/4 aerial refueling couplings. The FCT is equipped with on-site basic machining (i.e., drill press, grinder) and assembly (i.e., hose cutter, tube flarer, tools) capability to support test fabrication and set-up.

High Volume Fuel Flow Facility (HVFF) was developed to support Navy Aerial Refueling Systems. The HVFF provides the capability to dynamically simulate transfer and flow characteristics of various tanker-receive combinations, in-flight refueling engagements and disengagements and potential surge pressures relative to these functions. With this capability, we directly support research, development and qualification of critical aircraft fuel system components such as refueling nozzles, refueling couplings, pressure regulators, pressurization and venting valves, and external (drop) fuel tanks.

CAPABILITIES:

Variable Speed Drives Motors: The versatility of our test stand configuration and adaptable mounting flanges provide for a variety of test configurations and combinations of engine fuel pumps and/or accessory gearboxes. We have the following electric drive motors: 300 HP (21,000 RPM), 100 HP (30,000 RPM), 100 HP (8000 RPM), 50 HP (8000 RPM)

Conditioned Environment: An environmental air system is capable of supplying conditioned air from -80^{0}F to ambient at 1500 cfm and ambient to 600^{0}F at 5000 to a portable environmental chamber.

Conditioned Fuel: The fuel tempering system is capable of supplying up to 75 gpm fuel from -65^{0}F to 95 gpm from ambient to 375^{0}F. A clay filtering system is capable of "hardening" fuel for testing fuel system components and evaluating their sensitivity to low lubricity fuel.

Portable Environmental Chamber enables us to enclose components under test the various test stand locations. The conditioned fuel and air lines attach to the chamber and supply these items as needed.

Engine Simulation: Two systems are operational. One is based on a Xanalog digital computer capable of simulating up to 16 continuous dynamic engine parameters and discretes as required. The Xanalog system can be configured to represent any engine in the fleet and is capable of interfacing with any combination of hydromechanical and electronic control system hardware. The second is a real time simulation of the GE F414 engine based on a high fidelity cycle deck. This second system is a full aerothermal model of the engine with appropriate outputs to interface with a Full Authority Digital Electronic Control (FADEC). The F414 system is capable of full envelope test and evaluation of OFP engine software.

Drop Rig: Fully instrumented and capable of conducting pressurized dry and wet connects and disconnects. The drop rig also provides the capability to conduct angled disconnects for testing of aerial refueling components.

Additional Unique Test Equipment: Pressurization and Vent Valve Tester; Ground refueling nozzle and adapter testers; Pressure Surge Tester;

ACCOMPLISHMENTS:

Fuel System and Controls Testing:

- F414 Engine Auto Throttle Control (ATC) software test and evaluation
- F404 Engine Controls Life Verification Test

- F404 Engine controls and Accessories Closed Loop Simulation
- F404 Engine Fuel System Low Lubricity Test
- F402 Engine Fuel Control Carbon Fiber Test
- F402 Engine Fuel Control Low Lubricity Test
- F107 Fuel Control performance Verification Testing

Ground Fuel Components:

- Performance evaluation of Rapid Deployment Forces (RDF) ground refueling nozzle
- Qualification testing of Thiem D-1 ground refueling nozzle as alternate source
- Evaluation of Dry break quick disconnect couplings for refueling trucks
- Qualification of in-line pressure regulators to MIL-N-5877
- Shipboard refueling system characterization and optimization
- Emergency dry break characterization

Airframes Fuel Components:

- Evaluation and qualification of second source for F/A-18 external tank shut-off valve set
- Evaluation and qualification of Sweeny pressurization and vent valve
- Evaluation and testing of Aerial Refueling nozzles
- Component and system compatibility verification test for Helicopter In-Flight Refueling (HIFR) system
- Production and alternate source testing for A/A42R-1 Tanker Kit (buddy store)

For more information about the Fuel Systems, Controls and Diagnostic Test Facility at the Naval Air Warfare Center, Patuxent River, MD, contact 301-757-0433.